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Results of the Survey on the Use of Passenger Air Bag On-Off Switches

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16. Abstract

NHTSA conducted a survey to investigate how pickup truck drivers are using the passenger air bag on-off switches. The main two questions were how often the switches were turned off for child passengers and how often they were turned on for adult passengers. The survey was conducted from July to November 2000 in four States – California, Georgia, Michigan, and Texas.

On the whole, the switches have been a necessary and a fairly successful interim measure that made it possible to offer life-saving air bags to adult passengers in pickup trucks without back seats, while allowing the opportunity to protect infants and children from the hazards of air bags when they must ride in the front seats of those vehicles. Nevertheless, the survey shows many of the air bags are being left on for children and turned off for adults. Forty-eight percent of the air bags were left on when only child passengers 1-12 years old were in the front seat and 62 percent when a child and an adult passenger were in the front seat, potentially exposing these children to a deployment. There is also a problem when drivers ride with only adult passengers (age 13 and older). While 83 percent of the switches were on, as they should be, 17 percent were switched off.

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Even though passenger air bags have saved over 2,375 lives as of July 1, 2003, there are some people who should not be exposed to an air bag deployment. In May 1995, the National Highway Traffic Safety Administration (NHTSA) issued a Final Rule for Federal Motor Vehicle Safety Standard (FMVSS) No. 208, allowing manufacturers to install an on-off switch for the passenger air bag in vehicles that cannot accommodate a rear-facing child safety seat anywhere except in the front seat: e.g., pickup trucks and cars either with no rear seat or with rear seats too small to accommodate rear facing child safety seats. In November 1997, NHTSA issued another Final Rule enabling owners of any vehicle to obtain, at their own expense, an aftermarket on-off switch for their passenger air bag if they transport people in certain high-risk groups.

NHTSA's November 1997 rule also defined high-risk groups that should not be exposed to frontal passenger air bags: infants in rear-facing child safety seats, children 12 years old and younger, and adults with certain medical conditions.

The benefits of the switches are contingent on how they are used: the air bag should be turned off when a high-risk individual is seated behind it, and it should be turned on at other times. The passenger air bag should be deactivated when there is a child or infant seated in the right and/or center front seat and activated when there is an adult seated in the right front seat and there is no child or infant in the front center seat.

The manufacturers have furnished on-off switches in almost every pickup truck equipped with passenger air bags, beginning with some Ford Rangers in 1996, and extending to all models with passenger air bags by 1998. There were 11.7 million pickup trucks equipped with on-off switches on the road as of July 1, 2001. On the other hand, only 171,000 switches had been supplied as standard equipment as of July 2001 in cars or cargo vans without back seats. Only 91,482 driver or passenger aftermarket switches have been authorized by NHTSA in other vehicles as of August 2002 and only 12,513 are known to have been installed. Thus, over 97 percent of current switches are in pickup trucks.

Advanced air bags are now being developed that minimize the risk to infants and children. On May 12, 2000, NHTSA published a FMVSS No. 208 Final Rule requiring this technology to be phased in beginning with the 2004 model year. They may be designed to automatically turn the air bag on for adults and off for children less than about 6 years old. At this time in the development of air bag technology there is still a "gray" zone between 6 year olds and small adults where the air bag may or may not deploy. The air bag may be turned off for the 6 to 12 years old age group or deployed at a low force level presenting little or no risk for passengers in this age group. Sensor technology and air bag development continues in an attempt to solve this problem and eventually make air bag on-off switches unnecessary. But advanced air bags have not yet been offered in all production pickup trucks and NHTSA regulations will allow switches on pickup trucks until model year 2012, so conceivably there could be approximately 40 million pickup trucks manufactured with on-off switches if they continue to be equipped with the switches until 2012.

NHTSA conducted a survey to investigate how pickup truck drivers are using the switches. The two main questions were how often the switches were turned off for child passengers and how often they were turned on for adult passengers. Since the recommended switch setting depends on who is in the front seat at the moment, the survey was performed while the vehicles were occupied. Unlike shoulder belt use surveys, the setting of the on-off switch cannot be observed from a distance; it was necessary to talk to people in stopped vehicles.

The survey was conducted in four States—California, Georgia, Michigan, and Texas—because they have the nation's highest rates of newer light truck registrations and because they represent diverse geographic locations. Data collection occurred in a mix of metropolitan and non-metropolitan counties, but was not a national probability sample. The surveyors conducted 3,182 interviews in July – November 2000 where the air bag status was observed. This included 617 cases where at least one front seat passenger was an infant (less than 1 year old) or a child 1-12 years old.

On the whole, the switches have been a necessary and a fairly successful interim measure that made it possible to offer life-saving air bags to adult passengers in pickup trucks without back seats, while allowing the opportunity to protect infants and children from the hazards of air bags when they must ride in the front seats of those vehicles. Nevertheless, the survey shows many of the air bags are being left on for children and turned off for adults. Much of this could be averted by improved consumer information, but some of it is intrinsic to a system that relies on human intervention. On-off switches cannot be considered a long-term solution and must be superseded by devices that automatically turn the air bag on for adults and off for children, or by low-risk air bags, as required by the advanced air bag regulation.

The survey shows that owners of pickup trucks equipped with the switches are well-informed about some aspects of the switches and poorly informed about others.

The vast majority of owners know they have a switch, and what it does. Most of them knew the setting of the switch at the time they were surveyed. The great majority of owners know that air bags should be turned off for infants less than a year old and for "small" children, but on for adults.

Currently, the first and most serious problem with the switches is that owners often have little idea who is a "small" child in the context of air bags. Some people believe a 3- or 4-year old can be safely exposed to air bags, while others are afraid to expose even teen-age children over six feet tall. We believe the problem could be substantially alleviated by unequivocal information directed specifically to owners of pickup trucks: turn the switch off for children up to age 12, on for almost anybody age 13 or older. (See "Next Steps.")

A second, and intrinsic problem with the switches – some drivers cannot remember to turn them on and off as needed. Maximum benefits are obtained if people turn the switch on every time for an adult and off for a child, but some people would rather leave the switch off all the time rather than risk forgetting to turn it off for the child. This practice

leads to adult passengers not being protected by air bags.

A third problem – people are turning off the switches for older passengers, because they mistakenly assume a risk for passengers, who can sit far away from the instrument panel, similar to the very real risk for short, older drivers who must sit close to the steering wheel. Consumer information could help here.

A fourth problem – people who "don't like air bags" are turning them off in moderate numbers. Six percent of the drivers surveyed had the air bag off because they "don't like air bags." While very few people go to the effort and expense of obtaining aftermarket switches in cars, SUVs or vans, a substantially higher number are turning off the air bag in pickup trucks, where a switch comes with the vehicle as standard equipment.

A fifth, and intrinsic problem – vehicles with a child in the center front seat and an adult in the right front seat. Children 1-12 years old preferably should not be exposed to an air bag whereas nearly all adult passengers age 13 or older most likely would benefit from air bags. Therefore, drivers in these vehicles face a dilemma: should they turn off the air bag to protect the child or keep it on to protect the adult? Sixty-five percent of these drivers had the air bag on, potentially enhancing protection of the adult; only 35 percent were off, eliminating potential harm to the child from the air bag.

A sixth problem – people who borrow somebody else's truck either don't know about switches or are reluctant to change the setting.

Below are the specific findings and conclusions:

DRIVER'S KNOWLEDGE AND PERCEPTIONS

- Ninety-eight percent of the drivers interviewed knew their pickup trucks had a passenger air bag on-off switch.

- Ninety-seven percent of the drivers knew the setting of the switch at the time of the interview.

- About two thirds of the drivers who have used the switch and 35 percent of the drivers who have never used the switch volunteered that the primary purpose of the switch was to prevent children from being exposed to an air bag deployment.

INFANT PASSENGERS (LESS THAN 1 YEAR OLD AND/OR IN A REAR-FACING CHILD SAFETY SEAT)

- Drivers transporting children in rear-facing child safety seats or infants in the front seat achieved the highest rate of correct use: 86 percent turned the air bag off.

- In the four cases where the air bag was on, two were driving somebody else's truck and two mistakenly thought they had turned the air bag off. The public appears to be well-informed about the risk of air bags for infants.

CHILD PASSENGERS 1-12 YEARS OLD

- Forty-eight percent of the air bags were left on when only child passengers 1-12 years old were in the front seat and 62 percent when a child and an adult passenger were in the front seat, potentially exposing these children to a deployment.

- The percentage of switches turned on increased as children grew older.

    - When only child passengers were in the front seat, the following is the observed air bag status by age of child:

Age	Percent On
1-2 years old	27%
3-4 years old	24%
5-6 years old	26%
7-8 years old	41%
9-10 years old	53%
11-12 years old	70%

    - When a child and an adult passenger were in the front seat, 43 percent of the air bags were left on for 1-6 year old children and 68 percent were left on for 7-12 year olds.

ADULT AND TEEN-AGE PASSENGERS (AGE 13 AND UP)

- There is also a problem when drivers ride with only adult passengers. While 83 percent of the switches were on, as they should be, 17 percent were switched off.

- Many people know about the risk of air bags for short, elderly drivers who must sit close to the steering wheel, and they mistakenly assume a similar risk for passengers, who can sit far away from the instrument panel. The air bag was turned off for 56 percent of elderly (70 years old and older) right front passengers.

- Some parents feel that their teenage (13-15 years old) children should not be exposed to an air bag. Twenty-two percent of these drivers are turning the air bag off for their teenage passengers.

Observed Air Bag Status by Right Front Passenger's Age for Vehicles with Only Adult Passengers in the Front Seat

Right Front Passenger's Age	Percent Off
13-15	22%
16-19	17%
20-59	15%
60-69	19%
70+	56%

- Main reasons given for turning off the air bag for adult and teen-age passengers:
  - 15% frequently or occasionally have child passengers
  - 13% don't like air bags, are afraid of air bags, or think air bags are dangerous
  - 17% are afraid of injury to teenagers or senior passengers
  - 13% of the adult passengers want the air bag off
  - 5% forgot to turn it on
  - 37% for various other reasons

ADULT PASSENGER LIVES SAVED/LOST BECAUSE OF ON-OFF SWITCHES

Here are estimates of how many adult passenger lives are saved by air bags with on-off switches relative to no passenger air bags at all, and how many are lost by air bags with on-off switches relative to an air bag that is always "on" for adult passengers.

- With the switches turned on 83 percent of the time for adult passengers, passenger air bags have saved 81 lives by December 2001 in model year 1996-2001 pickup trucks relative to pickup trucks without passenger air bags.

- That number will grow to an estimated 329 adult lives saved over the full service life of these model year 1996-2001 pickup trucks, if switches continue to be turned off at the current rate.

- We estimate that 17 adult passenger lives have already been lost by December 2001 in model year 1996-2001 pickup trucks, because switches were turned off for adult passengers and they did not receive the benefits of air bags.

- That number will grow to an estimated 68 adult lives lost over the full service life of these model year 1996-2001 pickup trucks, if switches continue to be turned off at the current rate.

- If the switches continue to be installed in pickup trucks (excluding full crew cabs) until 2012 and turned off at the current rate, we estimate a total of 190 additional

adult fatalities over the full service life of all these 1996-2012 trucks, as a result of switches being turned off for adult passengers.

- Of course, this additional harm to adults must be viewed in perspective with the primary benefit of the switches: saving infants and children from exposure to deploying air bags. However, NHTSA does not have a quantitative estimate of lives saved by the switches.

NEXT STEPS

The on-off switches are not currently accomplishing all of their potential to eliminate the risk of air bags to children. NHTSA and its partners must increase efforts to educate the public on the dangers of air bags to toddlers and pre-teens, and their benefits for adults. This needs to be a continuing effort because these pickup trucks are durable (they sometimes last 25 to 30 years); they are sometimes resold to new owners; and new pickup trucks can be equipped with on-off switches until model year 2012.

In response to these needs, NHTSA plans to:

- Develop a public information and education campaign to instruct pickup truck drivers on the correct use of on-off switches and at what age children may be safely exposed to air bags.

- Highlight the use of on-off switches in pickup trucks in their many promotional safety and media events at the Federal, State and local levels.

- Press ahead with implementing the use of advanced air bags that minimize dangers to children automatically, without requiring action by motorists.

NHTSA will develop a communication plan to explore marketing strategies that will effectively reach pickup truck drivers. The only NHTSA brochure on on-off switches is for vehicle owners deciding if they can and should obtain an aftermarket on-off switch for one or both of their air bags, not for owners of trucks that already have the switches as standard equipment. While the current brochure advises owners they might consider aftermarket switches if they transport 1-12 year old children in the front seat, it does not explicitly say to turn off the passenger air bag for these children if they obtain an aftermarket switch or if the vehicle is already equipped with the switch. The newly developed information will clearly state that the passenger air bag should be turned off when children (less than 13 years old) are seated in the right and/or center front seat. This statement will not have any caveats such as if the truck has no space in the rear seat. Eighty-eight percent of the pickup trucks in the survey with rear bench seats had children sitting in the front seat even though space was available in the back seat. It will also advise drivers where the safest place is to seat child and adult passengers, depending on the type and number of seats available in their pickup truck, for different scenarios of

child and adult passengers. This information will be made available by the most effective means to pickup truck drivers and the general public.

NHTSA's partners should participate in NHTSA's education campaign or develop their own campaigns. They should also highlight the use of on-off switches in pickup trucks in their many promotional safety and media events at the Federal, State and local levels. If future vehicles have some kind of "safety checklist" software upon starting the engine, then manufacturers should include asking the driver of vehicles equipped with on-off switches if the passenger air bag should be on or off and advising them of its current setting. If NHTSA and its partners can educate the public to always turn the air bag off for children and on for adults, then we will increase the benefits of the on-off switches.

CHAPTER 1: INTRODUCTION, SURVEY METHODS

Background

Even though passenger air bags have saved over 2,375 lives as of July 1, 2003, there are some people who should not be exposed to an air bag deployment. "The agency recommends that newborn children be secured in a rear-facing child restraint system. … Placing a rear-facing safety seat in the front seat of a vehicle equipped with a passenger air bag raises a safety concern. This concern is that the deploying air bag might injure the infant, restrained in the child safety seat, when the air bag strikes the rear-facing child restraint. An air bag must inflate quickly to create a protective cushion that protects occupants during frontal crashes. The quickly deploying air bag strikes the back of the rear-facing child restraint with tremendous force, creating a situation whereby the infant might be injured."[1] In response to this safety concern, the National Highway Traffic Safety Administration (NHTSA) issued a final rule in May 1995 (FMVSS No. 208 60 FR 27233) allowing manufacturers to install an on-off switch for the passenger air bag in vehicles that cannot accommodate a rear-facing child safety seat anywhere except in the front seat: e.g., pickup trucks and cars either with no rear seat or with rear seats too small to accommodate a rear-facing child restraint system.

In November 1997, NHTSA issued another final rule (62 FR 62406) defining high-risk groups that should not be exposed to passenger air bags: infants in rear-facing child safety seats, children 12 years old and younger, and adults with certain medical conditions. The rule enables owners of any passenger car, pickup truck, van, or sport utility vehicle to obtain an on-off switch for their passenger air bag if they must transport people in one of these high-risk groups in the front seat. The benefits of these regulations are contingent on the correct use of the switches: that the air bag is turned off when a high-risk individual is seated behind it, and turned on at other times.

NHTSA conducted a survey to investigate how pickup truck drivers are using the switches. The main questions that the study sought to answer were how often the switches were off for child passengers and how often they were on for adult passengers. The switches are primarily found in newer model year pickup trucks. Passenger vehicles with aftermarket air bag on-off switches, plus other vehicles with original equipment on-off switches (such as Dodge Vipers and Dodge Cargo Ram vans), were not included in the survey because there were so few with on-off switches.

Since the correctness of the switch setting depends on who is in the front seat at the moment, the survey was performed while the vehicles were occupied. Unlike shoulder belt use surveys, the setting of the on-off switch cannot be observed from a distance; it was necessary to talk to people in stopped vehicles.

[1] *Final Regulatory Evaluation – FMVSS No. 208 Air Bag Cutoff Device*, NHTSA, November 1996.

Recommended Setting for On-Off Switches

"In October 1992, NHTSA published a final report[2] describing child restraint/passenger side air bag interactions. … The agency concluded that rear-facing child restraints (infant or convertible) should not be used in the front seat of a vehicle with a passenger-side air bag. Also, if a child in a forward-facing child restraint must be placed in the front seat, the seat should be moved as far rearward as possible."[3] Therefore, NHTSA recommends, a "rear-facing infant seat must never be placed in the front seat unless the [passenger side] air bag is turned off."[4] Thus, the passenger air bag should be turned off when a rear-facing child safety seat is in the front seat of a pickup truck.

According to a 1997 NHTSA brochure on the switches, children ages 1 to 12 may be better off with an air bag on-off switch if they must be transported in the front seat in a vehicle with a passenger air bag. The brochure went on to say that children ages 1 to 12 years old "can be transported safely in the front seat if they are properly belted, they do not lean forward, and their seat is moved all the way back. The vast majority of all fatally injured children in this age range were completely unrestrained. But children sometimes sit or lean far forward and may slip out of their shoulder belts, putting themselves at risk. The simple act of leaning far forward to change the radio station can momentarily place even a belted child in danger. If a vehicle owner must transport a child in the front seat, the owner is eligible for an on-off switch for the passenger air bag. Since vehicle performance differs from vehicle model to vehicle model, the vehicle owner may wish to consult the vehicle manufacturer for additional advice."[5]

In 2003, the agency adopted a new policy for consumers on air bag on-off switches:

> If your vehicle has an air bag on-off switch for the passenger air bag, and you must transport children aged 12 and under in the front passenger seat, turn the switch to the "air bag off" position.

The 1997 brochure implied that children may be at increased risk for injury if exposed to an air bag, but did not tell consumers to turn the air bag off for children. The new policy does advise consumers to turn the air bag off for children. The agency would probably alter their guidance on the use of switches in vehicles equipped with advanced air bags, if these air bags function as intended. But until that time, NHTSA is recommending that air bag on-off switches be turned off for children 12 and under.

Adult passengers with unusual medical or physical conditions "who have been advised by a physician that an air bag poses a special risk to them because of their condition"[6] should turn the air bag off. "However, they should not turn off their air bag unless their physician also has advised them that this risk is greater than what may happen if they do

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[2] Sullivan, *Child Restraint/Passenger Air Bag Interaction Analysis*, NHTSA, Report No. DOT HS 808 004, October 1992.
[3] *Final Regulatory Evaluation - FMVSS NO. 208 Air Bag Cutoff Device*, NHTSA, November 1996.
[4] *Air Bags & On-Off Switches: Information for an Informed Decision*, NHTSA, Report No. DOT HS 808 629, November 1997.
[5] Report No. DOT HS 808 629
[6] Report No. DOT HS 808 629

turn off their air bag."[7] The air bag should be turned on for all other adult passengers. "This includes short people, tall people, older people, pregnant women – in fact, all people male or female over age 12, who buckle their seat belts and who can sit with 10 inches from the center of their breastbone to where the air bag is stored."[8] Thus, since very few adults will have medical or physical conditions that put them at risk, the passenger air bag should be turned on for almost all adult passengers in the right front seat of pickup trucks.

In vehicles equipped with passenger air bag on-off switches, NHTSA's safety standard (FMVSS 208, S 4.5.4.4) requires the vehicle owner's manual to state that the on-off switch should only be used when a high-risk passenger is in any front passenger seating position. Thus, owner's manuals explicitly recommend turning off the air bag only if at-risk passengers such as children up to 12 years old are in any front seat position. For example, the 1999 Chevrolet C/K pickup manual says, "The switch should only be turned to AIR BAG OFF if the person in the right front passenger's position is a member of a passenger risk group identified by the national government as follows:

Infant. An infant (less than 1 year old) must ride in the front seat because:

- My vehicle has no rear seat;
- My vehicle has a rear seat too small to accommodate a rear-facing infant seat; or
- The infant has a medical condition which, according to the infant's physician, makes it necessary for the infant to ride in the front seat so that the driver can constantly monitor the child's condition.

Child age 1 to 12. A child age 1 to 12 must ride in the front seat because:

- My vehicle has no rear seat;
- Although children ages 1 to 12 ride in the rear seat(s) whenever possible, children ages 1 to 12 sometimes must ride in the front because no space is available in the rear seat(s) of my vehicle; or
- The child has a medical condition which, according to the child's physician, make it necessary for the child to ride in the front seat so that the driver can constantly monitor the child's condition.

Medical Condition. A passenger has a medical condition which, according to his or her physician:

- Causes the passenger air bag to pose a special risk for the passenger; and
- Makes the potential harm from the passenger air bag in a crash greater than the potential harm from turning off the air bag and allowing the passenger, even if belted, to hit the dashboard or windshield in a crash."[9]

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[7] *Air Bags & On-Off Switches: Information for an Informed Decision*, NHTSA, Report No. DOT HS 808 629, November 1997.
[8] Report No. DOT HS 808 629
[9] *Chevrolet C/K Full-Size Pickup*, Owner manual, 1999.

Ford 1999 F-series owner's manual states the air bag should only be off for the same three passenger risk groups and uses language very similar to Chevrolet 1999 C/K owner's manual.

Therefore, occupants may be at increased risk for injury if:

- The air bag is ON when a rear-facing child seat is in the right and/or center front seat;
- The air bag is ON when a child aged 1-12 is in the right and/or center front seat; and
- The air bag is OFF when an adult older than 12 is in the right front seat and there is no child or infant in the center front seat.

Scope

The survey was conducted in four States—California, Georgia, Michigan, and Texas—because they have the nation's highest rates of newer light truck registrations and because they represent diverse geographic locations. Data collection occurred in a mix of metropolitan and non-metropolitan counties. Table 1 indicates the counties where data were collected for the study.

Table 1: State, Counties and Type of County included in Survey

Team Number	State	Counties	Type of County
1	California	Fresno	Metropolitan
2	California	Sacramento, San Joaquin	Metropolitan
3	Georgia	Cobb, Fulton	Metropolitan
4	Georgia	Muscogee	Non-Metropolitan
5	Michigan	Kent	Metropolitan
6	Michigan	Wayne, Oakland	Metropolitan
7	Texas	Bexar	Metropolitan
8	Texas	Harris	Metropolitan
9	Texas	Smith, Upshur	Non-Metropolitan

The study was limited to late model pickup trucks equipped with a passenger air bag and, in most cases, an on-off switch to allow deactivation of the passenger air bag. Passenger vehicles with aftermarket air bag on-off switches, plus other vehicles with original equipment on-off switches (such as Dodge Vipers and Dodge Cargo Ram Vans), were not included in the survey because there were so few with on-off switches. Some vehicles included in the survey (but excluded from the analyses) may have had no switch because the vehicle has a full back seat. Table 2 lists the manufacturer, model, and the first model year of the vehicles targeted in the study that had on-off switches. All subsequent model years were included in the study.

Table 2: Truck Models with On-Off Switches

Manufacturer	Model	Year Air Bag On-Off Switch Became:			Manufacturer	Model	Year Air Bag On-Off Switch Became:	
		Optional	Standard				Optional	Standard
Chevrolet	S-10		1998		GMC	Sonoma		1998
	C/K Pickup		1997			Sierra		1997
	Silverado		1999		Isuzu	Hombre		1998
Ford	Ranger	1996**	1998		Mazda	B-Series		1998
	F-150/250*		1997		Nissan	Frontier		1998
	F-350	1998	2000		Toyota	Tacoma		1998
Dodge	Dakota		1998			Tundra		2000
	Ram		1998					

* Depending on the cab type, some heavy duty F-250's may not have passenger air bag on-off switches.

**Passenger air bags were optional, but the switch was standard on all trucks with passenger air bags.

In model year 2000, several manufacturers made the rear seat of their crew cab pickup trucks big enough to accommodate a rear facing child safety seat. These trucks were equipped with a passenger air bag but not an on-off switch. Since then, almost all pickup truck manufacturers have introduced crew cab pickup trucks with rear seats big enough to accommodate a rear facing child safety seat. Even some of the compact pickup trucks offer crew cabs with rear seats big enough to accommodate rear facing child safety seats. Table 2a shows the truck models with passenger air bags but not on-off switches. Very few of these pickup trucks were on the road during the survey, but since then they have become popular vehicles.

Table 2a: Crew Cab Truck Models with Passenger Air Bags but Not On-Off Switches

Manufacturer	Model	Cab Name	Year Air Bag On-Off Switch Dropped:		Manufacturer	Model	Cab Name	Year Air Bag On-Off Switch Dropped:
Chevrolet	S-10	Crew	2001		GMC	Sonoma	Crew	2001
	Silverado	Crew	2001			Sierra	Crew	2001
Ford	F-150	Crew	2001		Lincoln	Blackwood	Crew	2002
	F-250	Crew	2000		Nissan	Frontier	Crew	2000
	F-350	Crew	2000		Toyota	Tacoma	Double	2001
Dodge	Dakota	Quad	2000			Tundra	Double	2004
	Ram 1500	Quad	2002					
	Ram 2500-3500	Quad	2003					

Ford Ranger Crew Cab and Mazda B Crew Cab pickup trucks introduced in model year 2002 have on-off switches because even the crew cab has center-facing rear jump seats.

The sample was designed to ensure that four groups defined by different driver and right front passenger seat combinations were included in the study. These four groups and their target representation in the study are:

25	Drivers and right front infant passengers, less than a year old,
700	Drivers and right front child passengers, 1-12 years old,
1,000	Drivers and right front adult passengers, more than 12 years old, and
1,000	Drivers with no right front passengers.

Drivers without a right front passenger were included in the survey because 1) they would be the most common type of driver and right front passenger combination and 2) the drivers could still give relevant information on their use of the passenger air bag on-off switch and their perceptions about air bags. The survey would find out if and why they had the air bag turned off even when there was no one to protect; if and why they had previously turned the air bag off; and if they knew that air bags were dangerous to infants, children, and adults who could not sit more than 10 inches away from the air bag.

Two-person data collection teams surveyed the pickup truck occupants. One team member interviewed the drivers about the status of the on-off switch, their reasons for turning the switch on or off, and their opinions on the risks and benefits of air bags, and the age, height and weight of the front seat passengers. They recorded this information on the Interview Record data form. The other team member observed the make and model of the vehicle, number of seating positions and placement of occupants, availability and status of the on-off switch, and the restraint use, sex and race of any occupant. They recorded this information on the Vehicle Record data form. Appendix A has the Interview and Vehicle Record data forms.

The data collection teams were trained during two 2-day training sessions held at the contractor's office in Silver Spring, MD. During the training sessions, data collection teams were given a detailed explanation of the study and their responsibilities as data collectors. The teams practiced data collection procedures by role-playing with other training session participants. The training sessions also provided opportunities to observe different truck models and on-off switches at an automobile dealership. Lastly, data collectors visited sites in the suburban Maryland area to practice site selection and data collection techniques.

The survey was conducted in parking lots of retail stores, community facilities, recreational/entertainment facilities, and vehicle maintenance facilities. The teams identified sites through their knowledge of their assigned study area and reconnaissance. The sites were selected based on the following criteria:

- **Pickup truck volume.** A comparatively large number of pickup trucks had to pass through a site, at the time of day that the team planned to conduct interviews.

- **Data collection location and safety.** For safety reasons, sites had to:

    - Be located off-road
    - Have a stop sign where pickup trucks would come to a stop so that the data collectors could recruit drivers for the study
    - Have a low enough volume of vehicles (trucks and cars) so that traffic would not be unduly held up
    - Have a safe place for data collectors to stand with a good line-of-sight for oncoming vehicles

- **Pickup truck passenger characteristics.** Highest priority was given to sites with the greatest likelihood that drivers would have passengers who were children.

Our contractor established a contact with the Wal-Mart Foundation, who agreed to allow our surveyors to use Wal-Mart stores as data collection sites. Data collection teams identified suitable Wal-Mart store locations, and this information was forwarded to the Wal-Mart Foundation, who communicated with individual stores to inform them of the effort. Data collection teams were then given store manager names and contact information to make arrangements to conduct the survey. For the other sites used in the survey, the data collection teams had to get permission from the site owner or manager to collect data at that site before they used the site.

The data were collected at 79 different sites. Table 3 shows type of sites by their frequency. "Other retail stores" included home improvement centers, grocery stores, department stores, and other discount department stores. "Community facilities" included parks, schools, day care centers, community centers, churches, and post offices. "Recreation/entertainment facilities" included privately owned water parks, movie theatres, and bowling alleys. "Vehicle maintenance facilities" included car washes and gas stations.

Table 3: Number and Type of Sites included in the Survey

Type of Site	Number
Wal-Mart	13
Other retail store	29
Community facility	23
Recreation/entertainment facility	9
Vehicle maintenance facility	5
Total	79

Data collection began on July 1, 2000, and ended on November 22, 2000. Table 4 shows the number of surveys collected by team. The Texas teams and the Muscogee County, GA team collected data throughout the 5-month period. The California teams and Kent County, MI team collected data for 3 months. Two of the teams (Cobb/Fulton Co. and Wayne/Oakland Co.) collected data for less than two weeks. The Texas teams and the Muscogee County, GA team were the most successful teams. They collected 69 percent

of the data, but they collected 86 percent of the surveys that involved infant and child passengers (See Table 28).

Table 4: Number of Surveys Collected by Team

Team	Total
Smith & Upshur Co., TX	**798**
Muscogee Co., GA	**647**
Fresno Co., CA	**615**
Harris Co., TX	**499**
Bexar Co., TX	**316**
Sacramento & San Joaquin Co., CA	**224**
Kent Co., MI	**156**
Cobb & Fulton Co., GA	**18**
Wayne & Oakland Co., MI	**10**
Total	**3,283**

No information was collected on drivers who refused to participate in the survey. However, belt use by the participating drivers, adult passengers and child passengers was higher than the national average for occupants of pickup trucks. This suggests that many of the drivers who refused to participate were probably not restrained. But we have no idea how these drivers use on-off switches, so we cannot speculate on how this would affect the results of the survey.

The sample is not a probability sample of counties in the United States. Use of the switches could be different in other parts of the United States. However, there do not appear to be any obvious demographic or institutional factors (e.g., laws) in these areas that would make use of the switches higher or lower than average.

CHAPTER 2: RESULTS

The initial questions in the survey dealt with knowledge of the switch and perceptions about air bags. We wanted to know if the drivers knew that they had on-off switches for the passenger air bags; if they knew how to use the switches; and how they actually used them. There was some speculation before the survey that the driving public might be afraid of air bags because of the documented cases where people have been killed by air bags. There was also some speculation before the survey that drivers may turn off the air bags to avoid replacing them after a crash. The survey sought to answer these questions and conjectures. The findings on overall perceptions about air bags and overall use of passenger air bag on-off switches are in the first section of this chapter.

The most important information the survey provided was how the switches were being used. NHTSA recommends that the passenger air bag be deactivated when there is a child in the front seat and activated for the adult passengers. Six mutually exclusive groups of passengers were studied:

- A child in rear-facing child safety seat in the front seat,
- An infant in the front seat (less than 1 year old), not in a rear-facing safety seat,
- Only child passengers in the front seat (1-12 years old), not in a rear-facing safety seat,
- A child (1-12 years old) and an adult passenger (older than 12 years old) in the front seat, one in the center and the other in the outboard position,
- Only adult passengers in the front seat (older than 12 years old), and
- Pickup trucks without any front seat passengers.

Table 5 shows that 48 percent of the air bags were left on when only child passengers 1-12 years old were in the front seat and 62 percent when a child and an adult passenger were in the front seat, potentially exposing these children to a deployment. Drivers transporting infants not in rear-facing child safety seats turned the air bag off in all cases, but these infants could still be severely injured or killed in a crash because they were not properly restrained in a rear-facing child safety seat. Drivers transporting children in rear-facing child safety seats achieved the next highest percentage: 83 percent turned off the passenger air bags and only 17 percent left them on.

There is also a problem when drivers ride with only adult passengers. While 83 percent of the switches were on, as they should be, 17 percent were switched off. Many of these trucks often transport children, and the drivers either forgot to turn the switch on or kept the switch turned off permanently to guarantee their child would not be exposed to deployments. However, this deprived the adult passengers of any potential benefits of air bags. Surprisingly, 15 percent of drivers without any front seat passengers had the air bag turned off. In most of these cases, the air bag had been turned off to protect a child previously riding in the vehicle.

Table 5: Observed On-Off Switch Use by Driver and Passenger Group

Driver and Passenger Group	Air Bag On	Air bag Off	Total	Percent Off
Child passenger in a rear-facing child safety seat in the front seat	4	19	23	83%
Infant passenger in the front seat, less than one year old*	0	6	6	100%
Only child passengers in the front seat, 1-12 years old*	228	248	476	52%
A child and an adult passenger in the front seat*	69	43	112	38%
Only adult passengers in the front seat, older than 12 years old	849	172	1,021	17%
Vehicles without any front seat passengers	1,296	220	1,516	15%
Total	2,446	708	3,154	

* Not in a rear-facing child safety seat.

Each driver and passenger group will be discussed in detailed later in this chapter.

Perceptions

The surveyors conducted 3,283 interviews. The trucks had to have a passenger air bag, but not necessarily a passenger air bag on-off switch. Pickup trucks that were stopped by the survey teams and did not have a passenger air bag were not interviewed and not included in the study. Table 6 shows the observed status of the air bag switch for the trucks included in the survey.

Table 6: Observed Status of the Air Bag Switch

Observed Status	Number	Percent
Air bag switch on	2,466	75%
Air bag switch off	716	22%
Air bag switch status unknown	32	1%
No air bag switch	58	2%
Unknown if air bag switch	11	0%
Total	3,283*	

*Table 6 includes all cases, Table 5 was limited to cases where the air bag switch was observed to be on or off and the age and seating position of the occupants were known.

The surveyors observed that 97 percent of the pickup trucks had an on-off switch for the passenger air bag. This is slightly different from what drivers said. Ninety-eight percent (3,224) of the drivers interviewed said that their vehicle had an on-off switch. The surveyors did not observe a switch in 7 of those vehicles and could not see if there was a switch in 9 other vehicles. Two percent of the drivers (59) said their vehicle did not have an on-off switch. The survey team observed a switch in 6 of those vehicles and in 2 vehicles they could not see if there was a switch. Most of the drivers interviewed knew whether their vehicles did or did not have a passenger air bag on-off switch.

There were 3,182 cases where the air bag status was observed. In 97 percent of these cases (3,087), the air bag status given by the drivers matched the observed air bag status -

i.e., the driver said the air bag was on and the surveyors observed the air bag to be on or vice versa. In 2 percent of the cases (62), the air bag status given by the drivers was opposite the observed status i.e., the driver said the air bag switch was off when it was observed to be on or vice versa. In 23 cases, the driver did not know or refused to answer, "Is the air bag currently turned on or off?" In the other 6 cases, the driver said the vehicle did not have an on-off switch.

We interviewed 668 drivers who said they had the air bag turned off and gave a reason for turning off the air bag. Table 7 shows the reason these drivers gave for turning the air bag off. Sixty-five percent of the drivers stated that they turned the air bag off for an infant or child and 1 percent for small or fragile adult. This table does not imply correct use, only the reasons given for having the air bag turned off.

Some of the reasons given do not explain why the air bag was turned off. Ten percent of the drivers said they like, prefer, or always turn the air bag off. From that response it is unclear if the drivers always turn it off because they always have a front seat child passenger or because they are afraid of air bags.

Table 7: Current Reason for Turning the Air Bag Off
(668 Drivers Who Said the Air Bag Was "Off")

Reason Off	Number	Percent Off
Turn off for infant or child	431	65%
Turn off for small or fragile adult	8	1%
Previously had dog	3	0%
Like, prefer, or always off	66	10%
No passengers	35	5%
Don't like air bag or too dangerous	37	6%
Too expensive to replace	5	1%
Person of authority or current right front adult passenger wants the air bag off	31	5%
Don't know	23	3%
Other or unknown	29	4%
Total	668	

Six percent of the drivers turn the air bag off because they do not like air bags or are afraid of them. It also appears to be true that some drivers turned them off because the air bag is too expensive to replace. One percent explicitly stated they turned the air bag off to save on replacement costs. Another 5 percent turned them off when there is no right front passenger. This could be simply that there is no passenger to protect or it could be to save the driver the cost to replace it. In either case, it does not matter how some of these reasons are categorized. The most important finding is that not all drivers stated that they turn them off to protect a child, infant, or fragile adult, whereas NHTSA says the switches should only be turned off to protect babies in rear facing infant seat, children, or adults at risk because of an unusual medical or physical condition.

The surveyors asked all drivers, "How often do you turn off the passenger air bag?" Forty-nine percent of the drivers responded that they had turned the air bag off at least once. Table 8 shows the reasons those drivers gave for turning the air bag off. Again only 67 percent of these drivers had turned the air bag off for an infant or child.

Table 8: Reason For Turning The Air Bag Off
(1,441 Drivers Who Had Turned the Air Bag Off at Least Once)

Reason Off	Number	Percent Off
Turn off for infant or child	970	67%
Turn off for adult right front passenger	122	8%
Turn off for small, older, or fragile adult or medical condition	48	3%
Turn off for safety of passenger, but don't refer to a particular group of passengers	18	1%
Turn off because no right front passenger	21	1%
Like, prefer, or always on	51	4%
Like, prefer, or always off	46	3%
Don't like air bag or too dangerous	25	2%
Too expensive to replace	16	1%
Afraid of it going off, slow speed crash or unnecessarily	11	1%
Leave it off so I don't forget	3	0%
Turn it off once or twice just to see how	9	1%
Dog	1	0%
Don't know	43	3%
Other or unknown	57	4%
Total	1,441	100%

Fifty-one percent of the drivers responded that they had never turned the air bag off. The surveyors asked the drivers who had never turned the air bag off, "Under what circumstances, if any, would you turn it off?" Table 9 shows the reasons given. This table shows that 23 percent of the drivers who had never turned the air bag off would turn it off for an infant or child. Another 12 percent would turn it off for an infant or child passenger but explicitly stated that they had never had an infant or child passenger (7 percent) or that this was a work truck (5 percent).

Table 9: Under What Circumstances, If Any, Would You Turn the Air Bag Off?
(1,445 Drivers Who Have Never Turned the Air Bag Off)

Reason Given	Number	Percent
Would turn off		
If infant or child	333	23%
If right front adult passenger wants the air bag off	21	1%
If small, older, or fragile adult or medical condition	9	1%
If no passengers	6	0%
For passenger safety but don't refer to a particular group of passengers	31	2%
No reason to turn off		
No reason or circumstance to turn off	297	21%
No infant or child passengers	102	7%
Work truck	70	5%
Usually no passengers	33	2%
Always on		
Like or prefer on, wouldn't turn off, safer on	338	23%
Authority figure wants passenger air bag on	14	1%
Brand new, haven't turned off yet	27	2%
Someone else's truck	35	2%
Didn't know they could, don't understand use	14	1%
Don't know	67	5%
Other or unknown	48	3%
Total	**1,445**	**100%**

Most drivers of pickup trucks know their vehicles have a passenger on-off air bag switch. About two thirds of the drivers who have used the switch and even 35 percent of the drivers who have never used the switch volunteered that the primary purpose of the switch was to prevent children from being exposed to an air bag deployment.

Vehicles with Rear-Facing Child Safety Seats in the Front Seat

NHTSA believes that the air bag absolutely must be turned off if a rear-facing child safety seat is in the front seat, i.e., center front seat or right front seat. An air bag must inflate quickly to create a cushion that protects occupants during frontal crashes. The quickly deploying air bag strikes the back of the rear-facing child restraint with tremendous force creating a situation whereby the infant might be injured. The passenger air bag when it deploys is large enough that the bag could hit the back of a rear-facing child restraint even in the center seat.

The survey included 23 vehicles with a rear-facing child seat in the front seat. Drivers turned the air bag off 83 percent of the time (19 out of 23) when there was a rear-facing child safety seat in the front seat. Table 10 shows the air bag status by age of the child.

Table 10: Air Bag Status by Age of the Child in a Rear-Facing Child Safety Seat in the Front Seat

Age of the Child	Air Bag On	Air Bag Off
1-3 months old	2	1
4-6 months old	0	8
7-9 months old	0	3
10-12 months old	0	7
13-18 months old	2	0

The air bag was turned on in four vehicles with rear-facing child seats in the front seat. These drivers were putting the children at risk of serious injury or death if the air bag deployed. Three of the child seats were in the right front seat. The fourth child was in the center front seat and an adult was in the right front seat of this vehicles. Two of these drivers were driving somebody else's truck, an unfamiliar vehicle. The other two drivers thought the air bag was turned off and said they turned it off to protect their child.

Vehicles with an Infant in the Front Seat (Not in a Rear-Facing Safety Seat)

The agency says that children less than one year old should be restrained in a rear-facing child safety seat. There were 5 infants in the survey in forward-facing child safety seats.[10] Four of these infants were in the right front seat; the other was in the center seat. The air bag was turned off for all of these infants, but they are still at high risk in a crash because they should have been in a rear-facing, not a forward-facing child safety seat. There was one other infant in the right front seat with the air bag turned off but the surveyor did not know what type of restraint this infant was using.

Vehicles with Only Child Passengers Age 1-12 in the Front Seat

NHTSA considers children 1 to 12 years old in a risk group that preferably should not be exposed to an air bag. We have recently clarified our policy to state that if a child 1-12 years old must sit in the front and a switch is available, it should be turned off.

Most vehicles with only child passengers in the front seat had only a right front passenger and 50 percent of these vehicles had the air bag turned off. Table 11 shows the air bag status by seating position of child passenger. The air bag was turned on in 25 percent of the cases when a vehicle had child passengers in the center and right front seat and was turned on in 22 percent of the cases when a vehicle had only a child in the center front seat.

[10] There was one baby in the survey sitting on the lap of the right front passenger. Specific age of the child is unknown but the passenger side air bag was turned off to protect the baby.

Table 11: Air Bag Status by Seating Position of the Child for Vehicles with Only Child Passengers in the Front Seat

Seating Position	Air Bag On	Air Bag Off	Percent On
Center and Right Front	8	24	25%
Center Only	2	7	22%
Right Front Only	218	217	50%

Table 12 shows that the percentage of switches turned on increased as children grew older. Air bags were left on for 26 percent of children aged 1-6, already a substantial deterioration from the 17 percent that left the air bag on for children in rear-facing child safety seats. This increased to 41 percent at age 7-8, 53 percent at age 9-10, and increased to 70 percent at age 11-12.

Table 12: Air Bag Status by Age of Child for Vehicles with Only Child Passengers in the Front Seat

Age	Air Bag On	Air Bag Off	Total	Percent On
1-6 years old	**37**	**108**	**145**	**26%**
1-2 years old	6	16	22	27%
3-4 years old	10	32	42	24%
5-6 years old	21	60	81	26%
7-12 years old	**196**	**164**	**360**	**54%**
7-8 years old	40	58	98	41%
9-10 years old	77	67	144	53%
11-12 years old	79	39	118	70%

The driver often explained during the interview why the air bag was on or off. In some cases, the driver thought the air bag was off or forgot to turn the air bag off. In other cases, the air bag was intentionally on. In these cases, the drivers said air bags only needed to be turned off for babies, or for children younger than their passenger – or they left the switch on all the time, thinking that air bags were safe for all of their passengers.

Table 13 shows the intended air bag status by age of the child passenger. This table excludes drivers who did not know what the switch was for, drivers unfamiliar with the pickup, and drivers who did not respond. It appears that most drivers knew that toddlers (1-4 years old) may be at increased risk to injury from a deploying air bags. Some of the drivers of toddlers with the air bag on knew the child was safer with the air bag off. In 6 cases, the driver said they sometimes or frequently turn off the air bag when a child is in the front seat, but did not when they were surveyed. In two cases not shown in the table, the current driver did not turn the air bag off, but the drivers who frequently travel with these children do turn the air bag off. In one case, the driver knew his wife turned the air

bag off for the children. In the other case, the driver said, "daughter turns off when she is driving."

About a third of the drivers felt that the air bags were safe for young school-aged children (5 – 9 years old). But more than half of the drivers with 11 and 12 year old passengers felt that the child was big enough to be exposed to an air bag.

Table 13: Drivers Intended Air Bag Status by Age of Child Passengers

Age	Air Bag Off	Air Bag On Intentionally	Air Bag On By Mistake	Total	Percent Intentionally On
1-2 years old	16	1	3	20	5%
3-4 years old	32	5	3	40	13%
5 years old	23	10	2	35	29%
6 years old	37	6	1	44	14%
7 years old	19	12	4	35	34%
8 years old	39	16	3	58	28%
9 years old	22	10	4	36	28%
10 years old	45	44	10	99	44%
11 years old	13	25	4	42	60%
12 years old	26	41	4	71	58%

Since height and weight often correlate to the age it is not surprising that the percentage of switches turned on increased as the child passengers got heavier (Table 14) and taller (Table 15).

Table 14: Air Bag Status by Weight of the Child for Vehicles with Only Child Passengers in the Front Seat

Child's Weight	Air Bag On	Air Bag Off	Percent On
Under 20 lbs.	1	0	100%
20-29 lbs.	3	12	20%
30-39 lbs.	3	19	14%
40-39 lbs.	11	37	23%
50-59 lbs.	34	43	44%
60-69 lbs.	34	32	52%
70-79 lbs.	36	36	50%
80-89 lbs.	28	15	65%
90-99 lbs.	33	10	77%
Over 100 lbs.	30	16	65%

Table 15: Air Bag Status by Height of the Child for Vehicles with Only Child Passengers in the Front Seat

Child's Height	Air Bag On	Air Bag Off	Percent On
Under 3 feet	4	28	13%
3 ft. to 3 ft. 5 in.	6	35	15%
3 ft. 6 in. to 3 ft. 11 in.	16	21	43%
4 ft. to 4 ft. 5 in.	38	64	37%
4 ft. 6 in. to 4 ft. 11 in.	66	46	60%
5 ft. and over	84	35	71%

Table 16 shows that the percentage of air bags switched on increased as the drivers got older. More than likely most of the 1-12 year old front seat passengers are probably children of the drivers. Since younger parents tend to have younger children than the older parents and the percentages of switches off decrease as the children get older then older drivers should have the air bag switched on more than younger drivers. Column 5 of Table 16 shows the average age of the front seat passengers by driver's age category.

Table 16: Air Bag Status & Average Age of Child Passenger by Driver's Age for Vehicles with Only Child Passengers in the Front Seat

Drivers Age	Air Bag On	Air Bag Off	Percent On	Average Age of Child Passenger
16-29	60	94	39%	7.3
30-39	104	110	49%	8.7
40-69	51	35	59%	9.5

The survey included more female drivers than male drivers when a child is in the front seat. This is unusual for pickup trucks since men mostly drive pickups. But it is probably more common for mothers to transport their children than fathers during daytime, when the survey was conducted.

Overall, male drivers tend to switch the air bag on for 1-12 year old front seat passengers more than female drivers, but this is not true for all age groups of front seat passengers. Table 17 shows that 52 percent of male drivers and 43 percent of female drivers activated the air bag when only child passengers were in the front seat. For both female and male drivers, the percentage of air bags turned on tends to increase as the children get older.

Table 17 also shows the average age of the child by driver's gender and air bag status. Female drivers had slightly younger aged passengers than male drivers.

Table 17: Air Bag Status by Driver's Gender and Child Passenger's Age for Vehicles with Only Child Passengers in the Front Seat

	Female			Male		
Child's Age	Air Bag On	Air Bag Off	Percent On	Air Bag On	Air Bag Off	Percent On
1-2	5	11	31%	1	5	17%
3-4	3	23	12%	6	8	43%
5-6	14	40	26%	7	20	26%
7-8	24	35	41%	16	21	43%
9-10	46	36	56%	31	28	53%
11-12	29	17	63%	50	21	70%
Total	121	162	43%	111	103	52%
Average age	8.8	7.1		9.7	8.1	

Slightly more white and Hispanic-Latino drivers turn the air bag on for children than African-American drivers. Table 18 shows the air bag status by driver's race. There is little difference in the use of the switches by white and Hispanic-Latino drivers.

Table 18: Air Bag Status by Driver's Race for Vehicles with Only Children in Front Seat

Driver's Race	Air Bag On	Air Bag Off	Percent On
Caucasian*	159	163	49%
African-American*	38	53	42%
Asian-American	2	0	100%
Hispanic-Latino	27	30	47%

* Not Hispanic-Latino

A logistic regression analysis on the dependent variable air bag status and independent variables age of the child, age of the driver, gender of the driver, and race of the driver, shows only that the age of the child was significant. Drivers of older children turned the air bag on significantly more than drivers of younger children. The chi-square tests and logistic regressions throughout the report are descriptive tools only, and the "significance" for these results mean they would have been significant had our sample been a simple random sample.

Table 19 shows that 98 percent of children in vehicles with only child passengers in the front seat were restrained. Only 8 children were unrestrained. Most 1-2 year old children

were in front facing safety seats[11]. Most 5-12 year olds were lap/shoulder belted. Almost all of the lap belted children were in the center seat.

Restraint use for toddlers 1 to 4 years old in this survey was about the same as the national average, but restraint use for children 5 to 12 years old in this survey was much higher than the national average. The National Occupant Protection Use Survey (NOPUS) done in the fall of 2000 found that 45 percent of youth (5-15 years old) and 99 percent of toddler (1-4 years old) passengers were restrained in pickup trucks.[12] Youths in the right front passenger seat were "restrained" if in a shoulder belt. Toddlers were counted as "restrained" if they were in a child safety seat or a shoulder belt (but not if in a lap belt) in either the front or rear seat. State surveys in California and Georgia during 2001 also found that 94 percent of infants and toddlers were restrained. The State surveys had no information on restraint use for youths. The high percentage of youths restrained in our survey suggests a bias. It may be that drivers with unrestrained children in pickup trucks decided not to participate in our survey.

Table 19: Age of Child Passenger by Restraint Use for Vehicles with Only Child Passengers in the Front Seat

Child's Age	Lap/Shoulder Belted	Front Facing Safety Seat[11]	Lap Belted	Unrestrained	Percent Restrained
1-2	1	17	0	0	100%
3-4	22	14	5	2	95%
5-6	69	1	10	1	99%
7-8	86	0	9	2	98%
9-10	127	0	14	1	99%
11-12	114	0	0	2	98%
Total	419	32	38	8	98%

Table 20 shows that the percentage of air bag on for children in a front facing safety seat[11] is smaller than the percent of air bag on for children restrained by a lap/shoulder belt.

[11] Front facing safety seat includes both front facing child safety seats and booster seats. The data collectors were not experts in child passenger safety and had limited training in this area. We believe the data collectors could not accurately distinguish the difference between front facing child safety seats and booster seats, the categories on the data collection forms. Some child restraint systems can be used as both a child safety seat that restrains the child with a 5-point harness and as a booster seat that restrains the child with the lap/shoulder belt.

[12] Glassbrenner and Utter, *National Occupant Protection Use Survey - 2000 Controlled Intersection Study*, NHTSA Repot No. DOT HS 809 318, August 2001.

Table 20: Air Bag Status by Restraint Use and Age of Child for Vehicles with Only Child Passengers in the Front Seat

Child's Age and Restraint Type		Air Bag On	Air Bag Off	Percent On
Front Facing Safety Seat				
	1-2 Year Old	3	14	18%
	3-4 Year Old	2	12	14%
	5-6 Year Old	0	1	0%
Subtotal		5	27	16%
Lap/Shoulder Belt				
	1-2 Year Old	0	0	-
	3-4 Year Old	6	15	29%
	5-6 Year Old	21	48	30%
	7-8 Year Old	37	48	44%
	9-10 Year Old	70	55	56%
	11-12 Year Old	77	36	68%
Subtotal		211	202	51%

Vehicles with a Child and an Adult Passenger in the Front Seat

NHTSA considers children 1 to 12 years old in a risk group that preferably should not be exposed to an air bag whereas nearly all adult passengers age 13 or older most likely would benefit from air bags. Therefore, drivers with both a child and an adult in the front seat (one in the outboard position and one in the center position) face a dilemma: Should they turn the air bag off to protect the child or keep it on to protect the adult? While we might have expected most drivers to turn it off, the survey reveals that this is not so. Only 38 percent of the air bags were turned off when both a child and an adult were in the front seat. Most of these vehicles contain a child in the center front seat and an adult in the right front seat.

Drivers with an adult in the right front seat are more likely to turn the air bag on than drivers with a child in the right front seat. Table 21 shows air bag status by age of the center and right front passengers. The air bag was turned on in 65 percent of the cases when an adult was in the right front seat. When a child was in the right front seat, the air bag was turned on in only 45 percent of the cases. This is similar to the percent found turned on when only child passengers were in the front seat.

Table 21: Air Bag Status by Age of Center and Right Front Passengers for Vehicles with only a Child and an Adult in the Front Seat

Age of Center & Right Front Passengers	Air Bag On	Air Bag off	Total	Percent On
Child & Adult	60	32	92	65%
Adult & Child	9	11	20	45%

Table 22 shows the air bag status by placement of the child and age of the child. It appears that placement of younger children (1-6 years old) has an effect on the status of the air bag switch. More than half of the air bags were turned on when a 1-6 year old child was in the front center seat but only 20 percent were turned on when in the right front seat. There does not appear to be an effect on air bag status by child placement for older children (7-12 years old). About the same percentages of air bags were turned on when 7-12 year olds were in the center front as when they were in the right front seat.

Table 22: Air Bag Status by Placement and Age of Child for Vehicles with Only a Child and an Adult in the Front Seat

Child's Placement	Child's Age	Air Bag On	Air Bag Off	Percent On
Center Front	1-6	10	8	56%
Center Front	7-12	50	24	68%
Right Front	1-6	2	8	20%
Right Front	7-12	7	3	70%

A Chi-square test of independence on air bag status and child placement for 1-6 year old children show placement of the child was not significant. This means that drivers of young children in the center and adults in the right front seat are not turning the air bag on significantly more often than drivers of young children in the right and adults in the center front seat. It may be that there are not enough 1-6 year old cases for a statistically meaningful analysis.

Seventy-four percent of the drivers were male. And 65 percent of the male drivers turned the air bag on when a child and an adult passenger were in the front seat. A logistic regression shows that gender of the driver does not significantly affect the status of the air bag switch. However, it appears more female drivers know the air bags are dangerous for children in the center front seat than male drivers. Table 23 shows 46 percent of the female drivers turned the air bag on when a child was in the center front seat. This percentage is similar to the percentage of female drivers (44 percent) who turned the air bag on for vehicles with only child passengers in the front seat. But it appears that most male drivers think that the air bag is more dangerous for children in the right front seat. They turned the air bag on in 71 percent of the cases where a child was in the center front seat and 44 percent when a child was in the right front seat.

Table 23: Air Bag Status by Driver's Gender and Age of Center and Right Front Passengers for Vehicles with only a Child and an Adult in the Front Seat

Driver's Gender	Age of Center & Right Front Passengers	Air Bag On	Air Bag off	Total	Percent On
Female	Child & Adult	12	14	26	46%
Female	Adult & Child	1	1	2	50%
Male	Child & Adult	45	18	63	71%
Male	Adult & Child	8	10	18	44%

Vehicles with Only Adult Passengers in the Front Seat

The passenger air bag poses no risk to almost all adults over 12 years old if they are belted and correctly seated. Only adult passengers with unusual medical or physical conditions "who have been advised by a physician that an air bag poses a special risk to them because of their condition"[13] should turn the air bag off. NHTSA recommends that short people, tall people, older people and pregnant women can safely sit behind an air bag if they wear their seat belt and can sit 10 inches behind where the air bag is stored. Even belted adults without the air bag could hit their head, neck or chest in a crash that could cause serious or fatal injuries. Therefore, turning the air bag off when an adult right front passenger is present increases the risk of serious or fatal injuries.

The survey included 1,020 pick-up trucks with only adult (13 years old or older) passengers in the front seat. Most of the trucks had only an adult passenger in the right front seat (948). There were 58 cases with an adult passenger in the center front and right front seat and 14 cases with only an adult passenger in the center front seat.

Table 24 shows the air bag status by age of the adult right front passenger. The air bag was turned off for a higher percentage of senior right front passengers (70 years old and older) than any other age group. Drivers are more likely to turn off the passenger air bag when an older adult is riding behind the air bag than any other adult age group. Forty-four percent of the air bags that were switched off for 70 year old and older passengers were doing so to protect the older passengers. One driver said "He couldn't handle it if it opened." Obviously, many people know about the risk of air bags for short, elderly drivers who must sit close to the steering wheel, and they mistakenly assume a similar risk for passengers, who can sit far away from the instrument panel.

Table 24: Air Bag Status by Right Front Passenger's Age for Vehicles with Only Adult Passengers in the Front Seat

Right Front Passenger's Age	Air Bag On	Air Bag Off	Percent Off
13-15	98	27	22%
16-19	90	18	17%
20-29	231	33	13%
30-29	185	40	18%
40-49	119	21	15%
50-59	65	10	13%
60-69	43	10	19%
70+	7	9	56%
Total	838	168	17%

[13] *Air Bags & On-Off Switches: Information for an Informed Decision*, NHTSA, Report No. DOT HS 808 629, November 1997.

The air bag was also turned off for a slightly higher percentage of young teenage passengers (13-15 years old) than 16-69 years old passengers. Some parents feel that their teenage children should not be exposed to an air bag. Sixty-one percent of the air bags that were switched off for young teenage passengers are being turned off to protect the teenager. One parent said referring to his 14 year old, 6 foot 1 inch son, "I do not want my kid to be injured." Another parent said, "I think they are still too small." He was referring to his 14 and 15 year old daughters sitting in the center and right front seats, respectively.

Fifteen percent of the passenger air bags were turned off when 16 to 69 year old adults were seated in the right front seat. Table 25 shows the reason why the air bag was turned off for these adult passengers. The most common reasons given are: don't like air bags, sometimes has a child passenger, and adult driver or passenger wants the air bag off.

Table 25: Reason for Turning Off the Air Bag for Vehicles with Only 16 to 69 Year Old Adult Passengers in the Front Seat

Reason off	Number	Percent Off
Current teenager in right and/or center front seat	5	4%
Previously, recently or sometimes has a child	21	16%
Forgot to turn it on	9	7%
Don't like air bags, afraid of, or dangerous	22	17%
Adult wants off	20	16%
Always off (no reason given)	13	10%
Don't know, not their truck, or did not turn off	10	8%
Cost money to replace	3	2%
Other or did not respond	25	20%

There were five cases in which the driver turned the air bag off to protect his/her older teenaged (16-19 year old) child currently in the front seat. Sixteen percent of the air bags were off because the driver sometimes or often transports a child in the front seat. In four of these cases, the driver always left the air bag off because they sometimes have a child passenger and do not want to forget to turn it off whenever the child is in the front seat. In eight cases, the driver frequently or sometimes turned the air bag off because a child is sometimes a passenger. In the remaining nine cases, it is unclear if the driver intentionally left the air bag off because they sometimes have a child passenger. In nine other cases, the driver had forgot to turn the air bag on for the adult right front passenger. In three of those cases, the driver said they recently had a child in the front seat.

NHTSA does not endorse keeping the air bag off all the time if children are frequently transported in the front seat. NHTSA implicitly precautions against this, saying, "Since the air bag will not automatically turn itself back on after you turn it off with the on-off switch, you must remember to turn it on when someone who is not at risk is sitting in that seat. Every on-off switch has a light to remind you when the air bag is turned off."[14]

[14] *Air Bags & On-Off Switches: Information for an Informed Decision*, NHTSA, Report No. DOT HS 808 629, November 1997.

Nevertheless, this is a decision that anyone who must frequently transport children in the front seat will have to make for themselves, taking into account how likely they might be to forget turning it back off for the child, the relative frequency of adult and child passengers, and the age of the child. Ideally, a driver who is fully alert to the status of the switch should preferably turn it on for adults, off for children, and should review the status of the switch before each trip.

We surveyed more male drivers (739) with only adult passengers in the front seat than female drivers (278). This is not surprising since most pick-up trucks drivers are male. Again, slightly more female drivers turn the air bag off than their male counterparts when only adult passengers were in the front seat. This is similar to vehicles with babies or children in the front seat. The air bag should be turned **off** when a baby or a child is present in the front seat. It should be turned **on** when only an adult is in the front seat. Table 26 shows that more female drivers turn the air bag off than male drivers for any age group of adult passengers except 13 – 19 year old passengers.

Table 26: Air Bag Status by Sex Of Driver and Age of Right Front Passenger for Vehicles with Only an Adult Passenger in the Front Seat

Right Front Passenger's Age	Driver Female			Driver Male		
	Air Bag On	Air Bag Off	Percent Off	Air Bag On	Air Bag Off	Percent Off
13-19	79	19	19%	107	25	19%
20-29	53	10	16%	174	22	11%
30-39	37	12	24%	144	28	16%
40-49	20	10	33%	99	10	9%
50-59	9	3	25%	53	7	12%
60-69	7	5	42%	35	5	13%
70+	2	4	67%	5	4	44%
Total	207	63	23%	617	101	14%

A Chi-square test of independence on air bag status and gender of driver shows that overall female drivers turn off the air bag significantly more than male drivers when only adult passengers were in the front seat.

In this survey, 95 percent of the adult right front passengers in the front seat of vehicles with only adult passengers in the front seat were restrained. Again, this is a substantially higher rate of belt use than in the NOPUS 2000, indicating a possible bias that belt users were more willing to participate in the survey. The NOPUS found 45 percent of young adults (16 –24 years old), 61 percent of adults (25-69 years old) and 39 percent of seniors (70 years old and older) were using a shoulder belt. The percent of air bags turned off is nearly the same for belt users and nonusers. Seventeen percent of the restrained and 18 percent of the unrestrained adult right front passengers in the front seat were in a vehicle with the passenger air bag turned off. This implies that even safety-conscious passengers are riding behind a deactivated air bag.

Vehicles Without Any Passengers in the Front Seat

This group of vehicles has only drivers in the front seat. Therefore, there is no passenger whose risk is affected by how the switch is set. This section is just for comparison with the other groups of passengers.

Twenty to twenty-nine and thirty to thirty-nine year old drivers have the highest percentage of switches turned off. Table 27 shows the passenger air bag status by driver age. Twenty to thirty-nine year old drivers are more likely to have children and therefore more likely to occasionally have child passengers between 0-12 years than older drivers. The most common reason that drivers without any passenger in the front seat gave for turning off the air bag was to protect a child that was previously riding in the front seat.

Table 27: Air Bag Status by Driver Age Group for Vehicles Without Any Passengers in the Front Seat

Driver's Age	Air Bag On	Air Bag Off	Percent Off
16-19	35	3	8%
20-29	325	55	14%
30-39	295	83	22%
40-49	299	37	11%
50-59	219	26	11%
60-69	90	8	8%
70-79	17	3	15%
Total	1,280	215	14%

Regional

The sample was too limited to have any "regional" estimates. However, this section shows the amount of data collected by each team and the variation of results from team to team. Table 28 shows the number of surveys collected by team and type of vehicle occupant. Only five teams found children in rear-facing child safety seats and those same five teams surveyed most of the children. The other teams either did not collect data very long or were unsuccessful surveying trucks with children in the front seat.

Table 29 shows the air bag status and percentage of air bags turned off by team for vehicles with only adult passengers in the front seat. Muscogee, Bexar, and Harris Counties have a higher percentage of air bags turned off than the other counties. In these cases, the air bag should have been on to protect the adult. A chi-square test of independence on air bag status and team was statistically significant, indicating significant variation from one team to another.

Table 28: Number of Surveys by Team and Type of Vehicle Occupant

Team	Rear-Facing Child Seat	Infant in Front Seat	Only Children in Front Seat	Child & Adult in Front Seat	Only Adults in Front Seat	Only Drivers	Total*
Smith & Upshur Co., TX	12	0	168	5	116	490	**791**
Muscogee Co., GA	2	0	139	56	247	187	**631**
Fresno Co., CA	3	2	41	5	146	398	**595**
Harris Co., TX	1	3	56	15	202	161	**438**
Bexar Co., TX	5	1	47	27	179	56	**315**
Sacramento & San Joaquin Co., CA	0	0	15	4	86	101	**206**
Kent Co., MI	0	0	6	0	34	114	**154**
Cobb & Fulton Co., GA	0	0	4	0	10	1	**15**
Wayne & Oakland Co., MI	0	0	0	0	1	8	**9**
Total	**23**	**6**	**476**	**112**	**1,021**	**1,516**	**3,154**

*The totals in this table are less than Table 4 because this table was limited to cases where the air bag switch was observed to be on or off and the age and seating position of the occupants were known.

Table 29: Air Bag Status by Team for Vehicles with Only Adult Passengers in the Front Seat

Team	On	Off	Percent Off
Smith & Upshur Co., TX	104	12	10%
Muscogee Co., GA	200	47	19%
Fresno Co., CA	132	14	10%
Harris Co., TX	158	44	22%
Bexar Co., TX	145	34	19%
Sacramento & San Joaquin Co., CA	74	12	14%
Total	**813**	**163**	**17%**

Table 30 shows the air bag status and percentage of air bags turned on by team for vehicles with only children or child and adult passengers in the front seat. When only child passengers are in the front seat, Muscogee, Bexar, Smith and Upshur counties have a higher percentage of air bags turned on than the other counties. When a child and an adult are in the front seat, the percentage of air bags turned on is about the same as when only children are in the front for Muscogee, Bexar, Smith and Upshur counties. In these cases, the air bag should have been off to protect the child.

A simple Chi-square test is not meaningful here, because different areas of the country may have a different age population of children. In fact, an Analysis of Variance showed a significant difference in the age of children by team. The children surveyed in Muscogee County were older than in the other counties. Nevertheless, a logistic regression analysis on air bag status showed a significant difference among teams even after controlling for age.

Differences in air bag status by teams may be due to regional differences. Specifically, it may be that drivers in Muscogee County do not know that when air bags deploy, they are dangerous to children in the front seat. Or generally it may be that drivers in rural counties do not know that air bags are dangerous to children in the front seat. Of course, the number of counties in the study is too small to draw conclusions. However, the other rural counties in the study, Smith and Upshur Counties, also had a high 40 percent of the air bags turned on when a child was in the front seat. But at least most of these drivers knew that the air bag was dangerous to the infants in rear-facing child safety seats. In Smith and Upshur Counties, only 1 out of 12 infants were in the front seat of vehicles with the passenger air bag turned on whereas in Muscogee County 2 out of 2 infants were in the front seat of vehicles with the passenger air bag turned on.

Table 30: Air Bag Status by Team and Type of Front Seat Passengers

Team	Only Children in Front Seat			Child & Adult in Front Seat		
	On	Off	Percent On	On	Off	Percent On
Smith & Upshur Co., TX	68	100	40%	2	3	40%
Muscogee Co., GA	100	39	72%	39	17	70%
Fresno Co., CA	8	33	20%	5	0	100%
Harris Co., TX	17	39	30%	7	8	47%
Bexar Co., TX	26	21	55%	14	13	52%
Sacramento & San Joaquin Co., CA	4	11	27%	2	2	50%
Total	**223**	**243**	**48%**	**69**	**43**	**62%**

Distance Requirement

NHTSA recommends that front seat occupants who cannot keep 10 inches between the center of the air bag cover and their breastbone should turn the air bag off. "Air bags are designed to save lives and prevent injuries by cushioning occupants as they move forward in a front-end crash. By providing a cushion, an air bag keeps the occupant's head, neck, and chest from hitting the steering wheel or dashboard. To perform well, an air bag must deploy quickly. The force is greatest in the first 2 to 3 inches after the air bag bursts through its cover and begins to inflate. …occupants who are properly restrained and sit 10 inches away from the air bag cover will contact the air bag only after it has completely or almost completely inflated."[15]

The distance between the center of the air bag cover and the driver and right front passenger was observed in the survey. It was impractical to measure this distance. The observer only recorded whether these passengers seemed to meet the 10-inch requirement or not. Four percent of drivers in the survey sat less than 10 inches away from the air bag cover on the steering wheel. Four percent of right front passengers also sat less than 10

[15] *Air Bags & On-Off Switches: Information for an Informed Decision*, NHTSA, Report No. DOT HS 808 629, November 1997.

inches from the air bag cover on the dashboard. Table 31 shows that a higher percentage of children in rear-facing child safety seats in the right front position did not meet the distance requirement than the other types of right front passengers.

Table 31: Observed Distances from Right Front Passengers to Air Bag

Right Front Passenger Type	More Than 10"	Less Than 10"	Total	Percent Less Than 10"
Child in rear-facing safety seat	17	4	21	19%
Infant in forward-facing safety seat	5	0	5	0%
Child in right front seat	457	14	471	3%
Adult in right front seat	1,012	49	1,061	5%
Total	1,491	67	1,558	4%

It appears that drivers who are transporting a child in the right front seat who is less than 10 inches from the air bag are more likely to turn the air bag off to protect the child. The air bag was turned off in 64 percent of the cases where a right front child passenger sat closer than 10 inches to the air bag, while 51 percent of the air bags were turned off when a right front child passenger was more than 10 inches from the air bag.

The same is true for right front adult passengers. It appears that drivers who are transporting an adult in the right front seat who is less than 10 inches from the air bag are also more likely to turn the air bag off to protect the adult. Forty percent of right front adult passengers who were less than 10 inches from the air bag had the air bag turned off, whereas, only 18 percent of the right front adult passengers who were more than 10 inches from the air bag had the air bag turned off. None of these drivers gave a distance reason (he/she is too tall/heavy) as the reason for turning off the air bag.

Child Placement

Air bag on-off switches were initially allowed in pickup trucks because some pickup trucks do not have back seats and most of the pickup trucks that do have a back seat cannot accommodate a rear-facing child safety seat anywhere except in the front seat. Children less than 13 years old are also at increased risk from a deploying air bag. NHTSA recommends placing these children in the back seat of vehicles where they are safest. An earlier section of this report discussed how the switches were being used for children less than 13 years old. But also of interest is: Do children have to be in the right front seat of pickup trucks? If so, why must they be placed there? If not, then why are they placed there and what would cause the child to be placed elsewhere in the vehicle?

The survey identified whether a pickup truck had a back seat or not and described the type of back seat. The survey also counted the number of occupants in the back seat of the truck but the age of these occupants was not collected. Thus, we cannot identify if children are in the back seat of vehicles. But we can identify whether there were other available seats in the vehicle or children had to be seated in the front seat.

A NHTSA brochure states some reasons that children in child safety seats would have to be placed in the front seat of certain pickup trucks even if the truck has a back seat:

- "Small back seats--Many pickup trucks are too small to properly accommodate some child seats, especially those in the rear-facing position.

- Splits in bench seats--Splits in wide bench seats can make it difficult to install a child seat correctly.

- Pickup trucks jump seats/extended cabs – Child seats will not fit properly in many pickup truck rear seats. There is not enough space between the rear of the front seat and the child to allow forward motion in the event of a crash or even a sudden stop. Side facing jump seats are not safe for a child seat under any circumstances."[16]

There were 68 vehicles in the survey with a child in a child safety seat that was placed in the front seat. Sixty-three of the children were placed in the right front position and five were placed in front center position. Twenty-three of the vehicles had a back bench seat and 21 (21/68 = 31 percent) of these trucks had a seating position available in the back seat, but it is unknown if the child safety seat could have been properly installed in the available rear seating position.

Table 32 shows the number of children in the front seat not in child safety seats by type of back seat. Over 70 percent of the pickup trucks with a child in the front seat had a rear bench seat. Children are safest when properly restrained in the back seat whether the vehicle has an air bag or not. It is not known whether jump seats in the back of extended cab pickup trucks are safer for children than front seats. But clearly bench seats in the back of crew cab pickup trucks are safer for children than the front seat. Ninety-eight percent[17] of the children in the front seat of pickups trucks with rear bench seats did not have to sit in the front seat, because there were seats available in the back seat. Only two percent of the children had to be in the front seat because there was no space available in the back seat.

[16] *BUYING A SAFER CAR FOR CHILD PASSENGERS 2001*, NHTSA, Report No. DOT HS 809 160, January 2001.
[17] This excluded 31 cases where it is unknown how many occupants were in the back seat.

Table 32: Number and Percent of Children in Front Seat Not in a Child Safety Seat by Back Seat Type

Back Seat Type	Child	Percent
Bench Seat	355	71%
Jump	32	6%
None	114	23%
Total	501	100%

The surveyors also asked drivers, "Do you ever put your child in the center or back seat?" if there was a child in the right front seat when other seats were available. Eighty-one percent of the drivers said they would move the child to another seat and 19 percent said they would not. Then the surveyor asked the drivers why they would or would not move the child. Eighty-six percent of the drivers who would move the child would move them if they had more passengers. Only seven percent of the drivers would move the child for safety reasons but they were in a hurry and did not have time to put the child in another seating position.

Table 33 shows the reasons why drivers would not move the child from the right front seat. In six cases, the driver said the child was big enough to ride in the front. The children were from 8 to 12 years old. In 11 cases, the driver said it was too difficult to move the child to another seat. Most of these children were less than 2 years old and in a child safety seat. Most drivers who would not move the child to another seat had no reason and felt the child was safe sitting in the right front seat.

Table 33: Reason Why Driver Would Not Move Child from the Right Front Seat

Reason	Number
Air bag is off, no reason to move	2
Child is big enough for the front seat	6
Too difficult, too much trouble, not enough room in back seat	11
No other passengers, no reason to move	14
Child likes the front	7
Driver wants child up front	3
No back seat	4
No reason to move	9
Other or unknown	13

CHAPTER 3: EFFECTS ON PASSENGER FATALITIES IN CRASHES

The effect of on-off switches on passengers in crashes is twofold.

On the one hand, it would have been essentially impossible to install passenger air bags in pickup trucks where infants and children have no place to ride but the front seat, without some sort of manual or automatic technology to suppress air bag deployments for child passengers. Since on-off switches became available in 1996-98, whereas advanced, automatic suppression technologies were not phased in until 2003, the switches in essence made it possible to equip pickup trucks with passenger air bags seven years earlier, helping to save hundreds of adult lives.

On the other hand, as we have seen, the switches are often left on for children, potentially exposing them to a deploying air bag, and leaving them at greater risk than in a vehicle that has no air bags or suppresses their deployment. They are often left off for adults, depriving them of any protection from air bags. On-off switches are less effective than an ideal suppression system that always, automatically turns air bags off for children and on for adults.

Thus, the effect of on-off switches can be expressed as "a cup half full," relative to the fatality risk in trucks without any passenger air bags, or as "a cup half empty," relative to trucks with advanced air bags that deploy for adults but not for children.
Either way, however, NHTSA is unable to quantify the effect on child passenger fatalities. Children 12 years old and younger have a "non-quantifiable but increased risk"[18] of fatalities due to the air bag. Since the risk is non-quantifiable, we cannot estimate the lives saved because drivers turned off the passenger air bag for children. Nor can we estimate the lives lost because the passenger air bag was turned on for children. As of July 1, 2003, NHTSA's Special Crash Investigation program has documented 4 cases where a child in the front seat of a pickup truck has been killed in a low-speed crash by the passenger air bag. Three of these trucks were equipped with on-off switches and the switches were left on. The children were 2 months, 2 years, 5 years, and 8 years old. The position of the switch in the truck where the 5 year old was riding is unknown. The infant was properly secured in a rear-facing child safety seat, the 2-year-old was unrestrained, the 5-year-old was unrestrained and sitting on the lap of a passenger, and the 8-year-old was unrestrained.

The effects on adult fatalities are estimated as follows:

Adult Lives Saved/Lost as of December 2001 in Model Year 1996-2001 Pickup Trucks with Passenger Air Bag On-Off Switches

In the Fatality Analysis Reporting System (FARS), there were 8,873 pickup trucks with passenger air bag on-off switches involved in fatal crashes from 1996 to 2001. There were 729 adults sitting in the right front position killed in pickup trucks with a passenger

[18] 5th/6th *Report to Congress Effectiveness of Occupant Protection Systems and Their Use*, NHTSA, Report No. DOT HS 809 442, November 2001.

air bag on-off switch that only had adult passengers in the front seat. Some of these passengers were protected by the air bag because the air bag on-off switch was turned on and some were not because the switch was turned off.

To calculate the number of fatalities, we must first calculate the effectiveness of air bags that are off 17 percent of the time. Air bags are 12 percent effective in reducing adult fatalities in all crashes,[19] but the survey found that 17 percent of the time the passenger air bag was turned off when only adult passengers are in the front seat of pickup trucks. Therefore, passenger air bags in these trucks are 12% * (1 – 17%) = 9.96% effective in reducing fatalities.

Since there are actually 729 adult fatalities in pickup trucks with the switches, in crashes where only adult passengers sat in the front seat, then there would have been 729 / (1 - 9.96%) = 810 adult fatalities in these trucks if they did not have passenger air bags. If the switches in these trucks were always turned on to protect the adult right front passenger, then there would have only been 810 * (1 - 12%) = 712 adult fatalities. That is a reduction of 810 – 712 = 98 fatalities.

But since the switches are turned off 17 percent of the time, there were only 810 - 729 = 81 lives actually saved. Therefore, if the switches were always turned on when an adult right front passenger was present, then there would have been an additional 98 – 81 = 17 adults saved in these pickup trucks.

In summary:

- There were actually 729 adult fatalities in pickup trucks with air bag switches as used in crashes from 1996-2001.

- There would have been 810 adult fatalities in these pickup trucks if they did not have passenger air bags.

- Thus, the combination of passenger air bags and switches saved 81 lives relative to vehicle without air bags.

- There would have been 712 adult fatalities in these pickup trucks if the switches were always turned on to protect the adult passenger.

- There would have been 98 adult fatalities avoided (810- 712), if the passenger air bag on-off switches in all pickup trucks had been turned on 100 percent of the time for the adult passengers.

- An estimated 17 adults were not saved from 1996 to 2001, because the on-off switches were turned off for them.

[19] 5th/*6th Report to Congress Effectiveness of Occupant Protection Systems and Their Use*, NHTSA, Report No. DOT HS 809 442, November 2001.

Adult Lives Potentially Saved/Lost Over the Life of One Model Year Cohort of Pickup Trucks All Equipped with Passenger Air Bag On-Off Switches

Passenger air bag on-off switches became standard equipment on most pickup trucks in model year 1998. These trucks are relatively new and have had only a few years of exposure, but about half of these vehicles will still be on the road in 15 years. In this section, we will calculate the number of lives that will be saved over the life of one model year cohort of pickup trucks that are all equipped with passenger air bag on-off switches.

A good surrogate for the number of fatalities that will occur over the life of a model year cohort of pickup trucks is the fatalities that occur in one calendar year in pickup trucks of any model year. In FARS 2001, there were 832 right front adult fatalities in all pickup trucks that had only adult passengers in the front seat. Some of these trucks are equipped with a passenger air bag and an on-off switch, a few others are equipped with just a passenger air bag, and still others are not equipped with a passenger air bag. Below, the number of fatalities that occurred in these pickup trucks is subdivided into four groups by type of equipment available:

(1)	519	not equipped with a passenger air bag,
(2)	283	equipped with a passenger air bag and on-off switch,
(3)	15	equipped with a passenger air bag, but not equipped with a on-off switch,
(4)	4	equipped with a passenger air bag, unknown if equipped with on-off switch,
(5)	11	unknown if equipped with passenger air bag.

The first step is to calculate the number of potential fatalities that would have occurred if none of these trucks had been equipped with a passenger air bag. Since pickup trucks with a passenger air bag and on-off switches are 9.96% effective in reducing adult fatalities, there would have been 283 / (1 - 9.96%) = 314 fatalities in group (2) if these trucks were not equipped with a passenger air bag and on-off switch.

Since air bags are 12 percent effective in reducing fatalities, there would have been 15 / (1 – 12%) = 17 fatalities in group (3) if these trucks had not been equipped with a passenger air bag.

Let us assume that the trucks in group (4) had a passenger air bag and did not have an on-off switch. Since air bags are 12 percent effective in reducing fatalities, there would have been 4 / (1 – 12%) = 5 fatalities in group (4) if these trucks had not been equipped with a passenger air bag.

Let us assume that none of the trucks in group (5) were equipped with a passenger air bag. Then there would be 519 + 314 + 17 + 5 + 11 = 866 adult fatalities over the life of one model-year cohort of pickup trucks, if the trucks did not have passenger air bags.

- There would have been 866 * 12% = 104 lives saved by the air bag and switch over the life of the vehicle, if every truck had a passenger air bag and an on-off switch and the air bag was always turned on when an adult right front passenger was present (and there was no child passenger in the front seat).

- There would have been 866 * 9.96% = 86 lives saved by the air bags and the switches over the life of the vehicle, if all of the trucks had passenger air bags and on-off switches and the switches were turned off 17 percent of the time. In other words, the combination of passenger air bags and switches will save 86 lives relative to vehicles without passenger air bags.

- Therefore, an additional 104 – 86 = 18 adult lives will be lost over the life of these trucks because 17 percent of the on-off switches are turned off when they should have been turned on to protect the adult right front passenger.

If we repeat the analysis, using FARS 2000 instead of FARS 2001 data as a baseline, it produces an estimate of 82 lives saved by air bags and switches and 17 additional adult lives lost over the life of the trucks. Using the 1999 data produces an estimate of 79 lives saved by air bags and switches and 17 additional adult lives lost. Using the 1998 data produces an estimate of 74 lives saved by air bags and switches and 15 additional adult lives lost. Therefore, on average there will be 80.25 adult lives saved over the life of one model-year cohort of pickup trucks all equipped with passenger side air bags and on-off switches and the switches were turned off 17 percent of the time. Also, on average there will be 16.75 adult lives lost due to the air bag being turned off over the life of one model-year cohort of pickup trucks all equipped with passenger side air bags and on-off switches.

Adult Lives Potentially Saved/Lost Over the Life of Model Year 1996-2001 Pickup Trucks with Passenger Air Bag On-Off Switches

To estimate the adult lives saved/lost due to the air bag being turned off over the life of model-year 1996-2001 pickup trucks with on-off switches, we must first estimate the percentage of pickup trucks with on-off switches for model year 1996-2001 trucks.

Initially, manufacturers furnished on-off switches in almost all pickup trucks equipped with passenger air bags, beginning with some Ford Rangers in 1996 and extending to all models with passenger air bags by 1998. However, beginning with model year 2000, some crew cab pickup trucks were offered with passenger air bags but not on-off switches because the rear seat could accommodate a rear-facing infant seat. Since then all manufacturers have produced crew cab pickup trucks with rear seat areas big enough to accommodate rear-facing infant seats, so that these trucks do not have on-off switches. Table 2a lists the crew cab trucks without switches and shows the model year when they were first introduced without switches.

Using the FARS data, we estimated the percent of pickup trucks with switches by model year. Table 34 shows the estimated percent of pickup trucks in fatal crashes with the switches by model year. The passenger air bags were optional in the 1996 Ford Ranger and there is no way to identify which Rangers had passenger air bags. Therefore, we shall assume that no pickup trucks had switches in model year 1996. In FARS 1997 and 1998, 50 percent of model year 1997 pickup trucks had switches. That grew to 99 percent of model year 1998 trucks, but has dropped since the introduction of crew cabs

with rear seat areas big enough to accommodate rear facing infant seats. If the switches are turned off 17 percent of the time, the result will be (80.25 * 0%) + (80.25 * 50%) + (80.25 * 99%) + (80.25 * 89%) + (80.25 * 90%) + (80.25 * 81%) = 329 adult lives saved over the life of model years 1996-2001 trucks. If the current rate of the switches turned off continues for these trucks, the result will be (16.75* 0%) + (16.75 * 50%) + (16.75 * 99%) + (16.75 * 89%) + (16.75 * 90%) + (16.75 * 81%) = 68 additional adult fatalities over the life of model years 1996-2001 trucks.

Table 34: Percent of Pickup Trucks with Switches

Model Year	Percent with Switches
1996	0%
1997	50%
1998	99%
1999	89%
2000	90%
2001	81%

Adult Lives Potentially Lost Over the Life of All (Model Year 1996-2012) Pickup Trucks Equipped with Passenger Air Bag On-Off Switches

On-off switches may remain as standard equipment on pickup trucks until model year 2012. But by model year 2004, all crew cab pickup trucks except Ford Ranger and Mazda B Series will not have on-off switches. In FARS 2001 and 2002, 35 percent of model year 2001 pickup trucks are crew cab (excluding Ford Ranger and Mazda B Series crew cab trucks). So let us assume that in 2004-2012, 35 percent of pickup trucks will be crew cabs without switches, as in model year 2001. Let us assume that the percentage of crew cab pickup trucks without switches will increase linearly from 2001 to 2004. Therefore, 76 percent of model year 2002 pickup trucks will have switches and 70 percent of model year 2003 pickup trucks will have switches.

Besides the crew cab pickup trucks, advanced air bags are now being developed that can make the switches unnecessary by minimizing the risks to infants and children. On-off switches in pickup trucks allowed drivers to minimize the risk to infants and children well before the introduction of advanced air bags that automatically reduce the risk to infants and children. So the adult lives potentially saved over the life of all pickup trucks with on-off switches will not extend beyond model year 2007 when all new pickup trucks will be equipped with advanced air bags. However, let us also assume that manufacturers will continue to equip regular and extended cab pickup trucks with switches thru 2012. Then if the switches continue to be turned off at the current rate, that will result in 68 + (16.75 *76%) + (16.75 * 70%) + (9 * 16.75 * 65%) = 190 additional adult fatalities over the life of those 17 model years of trucks.

All of the preceding calculations are based on the assumptions that the 17 percent of air bags turned off in the 2000 survey is an accurate estimate of the national average and that in the future 17 percent of air bags will be turned off for adult passengers. If the national average were not 17 percent, then the estimates of additional adult fatalities would be

affected. If the average were less, then adult fatalities would be reduced. If higher, then more adult lives would be lost. Also, programs to increase public awareness of the recommended use of the switches could reduce the percentage of switches turned off for adults and reduce the number of lives not saved. In addition, if advanced air bags function as intended, there will be no need to turn the switches off. This would probably affect the public perception of the need to turn the switches off and alter the agency guidance on the use of switches, further reducing the percentage of switches turned off. Finally, the estimated number of vehicles with factory-installed switches could decrease, between now and 2012, if manufacturers believe they are no longer needed.

APPENDIX A

Interview and Vehicle Record Data Forms

OMB Control No. 2127-0579
Expires6/30/01

VEHICLE RECORD

TEAM		REC NO.					

1) Vehicle			
a) Make	( ) Chevy ( ) Dodge ( ) Ford ( ) GMC ( ) Mazda ( ) Nissan ( ) Toyota ( ) Isuzu		
b) Model			
c) Cab	( ) Regular ( ) Extended ( ) Crew	d) Status	( ) Running ( ) Accessory ( ) Off

2) On-Off Switch				
a) Available	( ) Yes ( ) No	b) Airbag	( ) On ( ) Off	

3) Seating / Occupants	FRONT	BACK	TRUCK BED
a) Seating Configuration	( ) Bench ( ) Bucket	( ) Bench ( ) Jump ( ) Sp Ben	
b) Number of Seating Positions			
c) Number of Occupants			

4) Driver / Front Passenger	DRIVER	CENTER PASSENGER	RIGHT PASSENGER
a) Seat Occupied		( ) Yes ( ) No	( ) Yes ( ) No
b) Restraint Use / Type (1) SHOULDER-LAP (2) LAP BELT (3) NONE (4) FRONT-FACING CHILD SEAT (5) REAR-FACING CHILD SEAT (6) BOOSTER	( ) 1 ( ) 2 ( ) 3	( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5 ( ) 6	( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5 ( ) 6
c) Meets Distance Requirement (10 inches)	( ) Yes ( ) No		( ) Yes ( ) No
d) Sex	( ) Female ( ) Male	( ) Female ( ) Male	( ) Female ( ) Male
e) Race / Ethnicity (1) CAUCASIAN (2) AFRICAN-AMERICAN (3) ASIAN-AMERICAN (4) HISPANIC/LATINO (5) NATIVE AMERICAN	( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5	( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5	( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5

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INTERVIEW RECORD

TEAM		REC NO.					SITE				DATE			/			TIME			:			A P	

1) Does your truck have a passenger air bag? ( ) Yes ( ) No ------> *TERMINATE INTERVIEW*

2) Does your truck have an air bag on-off switch? ( ) Yes ( ) No ------> *SKIP TO QUESTION 6*

3) Where is the switch located? ( ) LEFT ( ) CNTR-LOW ( ) CNTR-HIGH ( ) RIGHT

4) Is the air bag currently turned on or off? ( ) ON ( ) OFF

a) If Off: Why is the air bag turned off?

_____ | | | |

5) How often do you turn off the passenger air bag?

( ) NEVER ( ) RARELY ( ) SOMETIMES ( ) FREQUENTLY ( ) ALWAYS

a) *IF NEVER:* **Under what circumstances, if any, would you turn it off?**

b) *IF RARELY-ALWAYS:* **What are the major reasons why you turn it off?**

(1) _____ | | | |

(2) _____ | | | |

6) *IF CHILD IS IN RIGHT FRONT & OTHER SEATS ARE AVAILABLE:* **Do you ever put your child in the center or back seat?**

( ) Yes ( ) No

a) *IF YES:* **Why would you do that?**

b) *IF NO:* **Why not?**

_____ | | | |

7) I would like to ask a couple of questions about you [and your passenger(s)].

	DRIVER	CENTER PASSENGER	RIGHT PASSENGER
a) How old are you?	Years Months 0-12 13-19 20-29 30-39 40-49 50-59 60-69 70-79 80+	Years Months 0-12 13-19 20-29 30-39 40-49 50-59 60-69 70-79 80+	Years Months 0-12 13-19 20-29 30-39 40-49 50-59 60-69 70-79 80+
b) How tall are you?	Feet Inches	Feet Inches	Feet Inches
c) How much do you weigh? *IF AGED 12 OR UNDER:*		Lbs.	Lbs.

8) Finally, what is your truck's make, model and year?

a) Make	( ) Chevy	( ) Dodge	( ) Ford	( ) GMC	( ) Mazda	( ) Nissan	( ) Toyota	( ) Isuzu
b) Model					c) Year			

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